Commercial Space Transportation Advisory Committee
October 27, 2004
MEETING MINUTES

COMSTAC Chair John Vinter, president and chief executive officer, International Space Brokers, Inc., Rosslyn, Virginia, convened the meeting at 8:38 a.m., welcomed COMSTAC members and guests, and asked that members and alternates introduce themselves. Mr. Vinter acknowledged the presence of both the Honorable Norman Y. Mineta, Secretary of Transportation and the Honorable Marion C. Blakey, Administrator of the Federal Aviation Administration (FAA). He noted the presence of both the Secretary of Transportation and the FAA Administrator as an indicator of outstanding performance by the FAA's Associate Administrator for Commercial Space Transportation (AST).

Remarks by Secretary Norman Y. Mineta

Secretary Mineta acknowledged the leadership of COMSTAC Chairman, John Vinter, and thanked him and the members of COMSTAC for giving their time and energy to the work of the Committee. As a former member of Congress and member of the House Public Works and Transportation Committee, he stated that he had worked with many of the COMSTAC members to "shape the landscape for the next century of space flight." Secretary Mineta emphasized the historic significance of the flights of Scaled Composites' SpaceShipOne, noting that it was a "….journey into the history books as the first private manned vehicle to make the leap to sub-orbital flight and it was just a sketch on a napkin a few years ago." He also noted that "….the flights are a major step toward a new low cost era in space travel that will put access to space within reach of many, many citizens."

Secretary Mineta pointed out that the number one rule for transportation is safety and commended the U.S. commercial space transportation industry and AST for the perfect safety record of 167 licensed launches and no accidents. He also acknowledged the first FAA license for an inland spaceport and reentry site granted to the East Kern Airport District to operate at the Mojave Airport Civilian Flight Test Center, California, adding that AST is working with other states, including Oklahoma and New Mexico to develop commercial launch and reentry sites and that these efforts have the potential for bringing economic growth to states. Secretary Mineta concluded his remarks by stating that "… an important item on our agenda is to find a way consistent with our overriding goal of safety to support the burgeoning private sector interest in both manned and unmanned space transportation. As the country looks to resume the exploration of the moon and eventual

expedition to Mars, the United States is going to need that private sector launch capability. In fact, we are working with the Congress right now on legislation HR-3572, the Commercial Space Launch Amendment Act of 2004, that will one day make personal space travel available to the wider public."

Remarks by FAA Administrator Marion C. Blakey

Administrator Blakey provided her first-hand impressions of the October 4th prize-winning launch of SpaceShipOne at Mojave Airport, California. She emphasized the fact that even though the companies participating in the X PRIZE competition have small staffs, they are brilliant people with visions of future space travel, stating that "…aviation as we know it for so many years has turned the page. It has turned into aerospace transportation." She described the upcoming X PRIZE Cup event, which will take place in New Mexico in 2006, as a "NASCAR with rockets." She also noted the fact that representatives of big business view the future space travel proposals as lucrative ventures and investments, calling themselves "astropreneurs." Ms. Blakey emphasized that the Department of Transportation and the FAA will be ready, through partnerships with industry, to take on the challenges that will come with future space launch operations.

Ms. Blakey talked about the need to move from research, development and testing to full-scale, routine operations. She also discussed the risk involved in manned space flight, pointing out that the need for FAA and industry to begin now, addressing the issue of what are the acceptable levels of risk. She listed airspace requirements and technology as other critical areas that need to be addressed. She concluded by stating that "we need to support the industry and assist it with its growth while fulfilling the FAA's safety mandate."

Report on AST Activities

Dr. George N. Nield, Deputy Associate Administrator for Commercial Space Transportation, FAA, reported on AST activities since the May 2004 COMSTAC meeting. Dr. Nield reported that there were 13 licensed launches for FY 2004, including five Atlas launches, one Taurus launch, three Sea Launches missions, and four SpaceShipOne launches, making a total of 167 licensed successful launches with no accidents or damage to property. He also reported that AST staff member, Ed Springer, has become the second employee at the AST Safety Office at Patrick Air Force Base, Florida, along with Al Wassel.

Dr. Nield noted several additional milestones, including:

- the signing of a Memorandum of Agreement between the FAA, Air Force, and the National Transportation Safety Board which focuses on participation and leadership of accident investigations (Summer 2004);
- the announcement of the President's Vision for Space Exploration which calls for NASA to pursue commercial opportunities, thereby creating the potential for increased commercial space launch opportunities;
- the recent successful launch by Brazil;

- AST's issuance of the first license for a reusable launch vehicle to Scaled Composites and a second license to XCOR Aerospace (April 2004); and
- AST's issuance of the first license for an inland spaceport to Mojave Airport in California (June 2004).

Dr. Nield also talked about AST's on-going activities, including support of research and development in human space flight safety, structural inspection through bonded thermal protection systems, reentry vehicle hazard models development and orbital debris model; development of Operations and Maintenance guidelines; and efforts to streamline the environmental process, including the study of the feasibility of obtaining categorical exclusions for certain classes of launch vehicles.

Curriculum for the Future: AST/SpaceTec® Memorandum of Understanding

Dr. Al Koller, Executive Director for Aerospace Programs for Brevard Community College in Florida, provided the Committee with an overview of the programs and purpose of SpaceTec®. He began by listing the SpaceTec® goals:

- National resource for aerospace technical education;
- National infrastructure for curriculum validation and delivery;
- National skills standard certification; and
- National databases, public relations, website, marketing resources, outreach.

He explained that the SpaceTec® consortium is made up of 12 community colleges across the country, plus Embry Riddle, industry partners who serve on the National Advisory Committee, state aerospace agencies, and organized labor. He also reported that an Internet-based certification examination process would be started in approximately three weeks, which will include the Internet examination, followed by an oral and practical exam in front of a certified examiner. He noted that SpaceTec® has 17 examiners across the Nation.

Dr. Koller pointed out that SpaceTec® focuses on the work force skills and competencies for the aerospace industry and the technicians of the future and encouraged meeting attendees to get involved and provide input and ideas for curriculum development. He added that, in addition to the Memorandum of Understanding (MOU) with AST, SpaceTec® is also partnering with the Department of Labor, NASA, the Air Force, and the National Science Foundation.

COMSTAC member Lou Gomez asked whether a skill set for spaceports had been defined. Dr. Koller responded that the SpaceTec® technicians receive a broad, fundamental background consisting of basic electricity and structural and mechanical skills. He added that at Brevard Community College, there will be training in aerospace processing. COMSTAC member John Logsdon asked how students, who are beyond their formal schooling, are recruited. Dr. Koller responded that it is a very difficult thing to do but SpaceTec® uses unique approaches for the student recruitment, including an initiative at Kennedy Space Center's Space Launch Complex 47, which has been set aside for educational purposes. He noted that Pad 47 will be used to launch Super Loki

rockets in conjunction with the Civil Air Patrol and junior ROTC units across the Country.

After Dr. Koller's presentation, he and Patricia G. Smith, Associate Administrator for Commercial Space Transportation, participated in a ceremonial signing of the AST/ SpaceTec® MOU.

The National Space Society

George Whitesides, Executive Director of the National Space Society (NSS), provided an overview of the NSS. He noted that the NSS has about 20,000 member subscribers, and was founded in 1974 by Werner Von Braun, for the purpose of creating public engagement in the space program and the space industry. He added that NSS published ***Ad Astra*** magazine and has about 50 chapters around the world including a newly-established chapter in Florida. He provided the NSS vision: "people living and working in thriving communities beyond the earth;" and the NSS mission: "to promote social, economic, technological, and political change to advance the day when humans will live and work in space." He explained that the NSS has a Board of Governors, an honorary group, which includes such prominent space enthusiasts as Hugh Downs, Buzz Aldrin, and John Glenn; and a Board of Directors, which has fiduciary responsibilities.

Mr. Whitesides reported on some of the work and activities of the NSS, including the organization of meetings with Congressional members and staff with 75 citizens to discuss space exploration issues. He noted that this initiative was organized through the Space Exploration Alliance, an organization made up of several space advocacy groups. He reported that the NSS participated in both national political conventions in order to ensure that space was included in the national agenda. He pointed out that the NSS does petitions and letter drives in support of space exploration and that NSS members were first to purchase seats and charter a flight for future space tours. He announced the annual NSS conference to be held in Washington, May 19-22 in 2005, with the theme of "Your Ticket to Space."

America's Space Prize

Mike Gold, Corporate Counsel for Bigelow Aerospace, discussed the new America's Space Prize initiative, established by Robert Bigelow. Mr. Gold began by providing an overview of Bigelow Aerospace, which was established in 1999 for the exclusive purpose of developing and perfecting inflatable space habitat technology, based on technology developed and used by the NASA TransHab. He added that Bigelow is located in north Law Vegas over 50 acres of land, with approximately 60 employees, and utilizing a number of subcontractors.

Mr. Gold reported that Bigelow has built a full-scale demonstrator for design development and several smaller flight demonstrators called Genesis Pathfinder Spacecraft to be used for testing the inflatable systems in a microgravity environment. He added that the first flight of a Genesis Pathfinder Spacecraft would take place in November 2005 aboard the SpaceX Falcon 5 launch vehicle and a second flight is proposed for April 2006 on the Dneper (formerly the Russian SS-18) from Baikanour

Cosmodrome. He also reported that Bigelow is working with NASA Johnson Space Center through a Memorandum of Agreement and exclusive licensing agreements for the patent rights for TransHab work and for shielding technology.

Mr. Gold explained that Robert Bigelow's goal is to bring about affordable inflatable space habitats, and, in turn, he initiated the America's Space Prize to stimulate the development of affordable and economical method to carry crew and cargo to the space habitat. He reported that the America's Space Prize will be a $50 million purse, with $25 million supplied by Bigelow personally.

COMSTAC member John Logsdon asked what would it take to launch the full-scale inflatable (called Nautilus) and Mr. Gold replied that it would be in the Atlas V or Proton range. COMSTAC member Livingston Holder asked about the number of flights it would take to make the inflatable habitable. Mr. Gold responded that Bigelow is planning to do everything with one flight. Chairman Vinter asked about the amount of investment for this project. Mr. Gold reported that Bigelow's goal is less than $100 million per unit. AST staff member, Col. Austin Jameson asked if humans would be able to board the subscale models and Mr. Gold responded that the Genesis Spacecraft would not be habitable and that its primary purpose is to demonstrate the technology of the inflation process, the packing process, and the durability of the hull.

Update on the RASCAL Program

Jacob Lopata, Chief Executive Officer for Space Launch Corporation, provided an update on DARPA's Responsive Access Small Cargo Affordable Launch (RASCAL) Program. Mr. Lopata began by discussing the DARPA requirements for the RASCAL Program, including low cost, 24-hour turn around capability, the need to use conventional runways, the need to minimize infrastructural impact in development, and the need to use Mass Injection Pre-Compressor Cooling (MIPCC) technology. He noted that as a result of these requirements, an air launch system was chosen as the most suitable approach, using jet engine technology for propulsion, specifically military turbo fan engines which will be enhanced to go higher and faster and the upper stage can be released outside the atmosphere, at approximately 180,000 feet. He noted that this system is lighter, thereby being simpler and cheaper because it has no payload shroud and no gimballed nozzles. Mr. Lopata pointed out that RASCAL will be cheaper because it will be autonomous and will use existing commercial infrastructure, i.e., it will be built and integrated at Mojave Airport in California and launched from the Pacific Test Range.

Mr. Lopata described the launch, flight, and reentry scenarios planned for RASCAL and reported that the vehicle, designed and built by a team including Scaled Composites for design, ATK, BAE Systems and Athena, will be made almost completely with composite materials with a single-pilot cockpit. He described the MIPCC technology, which uses injected water and oxygen to cool incoming air and reported that the MIPCC is undergoing extensive tests, noting that, in addition to MIPCC testing, extensive risk mitigation is underway for the engine and the rocket, adding that the SpaceShipOne flights represented significant risk mitigation steps for the RASCAL program. Mr. Lopata described the vehicle design and discussed the roles and responsibilities for each

member of the subcontractor team. He reported that the Program is currently completing Phase II, a three and a half year phase, which will end with two demonstration launches.

COMSTAC member Livingston Holder asked about the types of commercial payloads being considered and whether there is growth capacity in the system. Mr. Lopata explained that there is potential for small satellites for asset tracking and imaging for disaster monitoring. He also said that if the system is successful, new ideas would probably spring up.

ARTWG/ASTWG Report

Keith Britton, Senior Project Manager, Operational Spaceport Projects Office at NASA Kennedy Space Center (KSC), reported on the status of the Advanced Range Technology Working Group (ARTWG) and the Advanced Spaceport Technology Working Group (ASTWG), the two groups headed by KSC and the Air Force to look at spaceport ground operations and range technologies. He noted that the long-term goal for space transportation is to have ground operations similar to airports where a launch vehicle lands, is processed, and then launches again. He emphasized low cost, responsiveness and safe access to space as the three components identified by the ARTWG and ASTWG to be most important for commercial development and stated that the working groups want to develop the technology strategy for implementing a modernized spaceport and range concept, which includes integrating seamlessly between the aerospace system and the existing air traffic control system.

Mr. Britton described the ARTWG and ASTWG as the national forum made up of over 500 members and over 90 government agencies (Federal and local), industry, and academic organizations that provide inputs to stakeholders that have an interest in spaceports and ranges. He noted that the ASTWG has identified five technology focus areas, including advanced servicing, transportation and handling, command control, inspection, and planning. He reported on the Future Interagency Range and Spaceport Technologies Program (FIRST), a new program designed to take the recommendations of the ARTWG and ASTWG and begin developing technologies. He announced the semiannual conference for the ARTWG and ASTWG, scheduled for January 11-13, 2005 in Colorado Springs, to be held in conjunction with the Air Force Space Command's Science and Technology Workshop.

COMSTAC member Lou Gomez asked if the ARTWG and ASTWG make recommendations concerning licensing and flight safety. Mr. Britton advised that the FAA (AST), as one of the partners, deals with those issues.

WORKING GROUP REPORTS

Risk Management Working Group (RMWG)

Chairman John Vinter discussed the issue of indemnification extension under the Commercial Space Launch Act that has been the main focus of the RMWG over the last few years. He noted that he had previously reported on S. 1260 and H.R. 3752, and that

currently H.R. 5245, which includes a five-year extension, has passed the House. He reported that at the working group meeting on Tuesday, October 26th, the RMWG agreed to draft a letter from COMSTAC to Ms. Smith urging support for H.R. 5245. The Chairman then asked for discussion from the members regarding the proposed letter and afterwards, the Committee agreed to send the letter.

Chairman Vinter also reported on the status of the space insurance market, noting that the market has gained more stability and the rates for first party insurance are stable. He discussed several cases, including the Sea Launch/Apstar mission, the Amazonas satellite and the Boeing 702 claims, which have now been settled.

RLV Working Group (RLVWG)

Randall Clague, from XCOR Aerospace, California, substituted for RLVWG Chair, Mike Kelly. He provided a summary of the RLVWG meeting on Tuesday. He also briefly discussed NEPA[1] requirements for RLVs and indemnification issues, and mentioned the fact that Scaled Composites would like to have a certification process for airplane-like launch vehicles. He also reported on the action items for the RLVWG. COMSTAC member Livingston Holder urged COMSTAC members and other industry representatives to send in comments for the AST O & M Guidelines.

New Business and Wrap Up

Since there was no new business, Mr. Vinter adjourned the meeting at 12:03 p.m.

John W. Vinter, Chairman, COMSTAC

[1] National Environmental Policy Act of 1969.

ATTENDEES

COMSTAC Members/Alternates

John Vinter, COMSTAC Chair, International Space Brokers, Inc.
Eleanor Aldridge, AIAA
Gerald Mussara, Lockheed Martin Corporation (Alternate for Mark Albrecht and Thomas Marsh)
Louis Gomez, New Mexico Office of Space Commercialization
Lisa Hague, The Boeing Company (Alternate)
Gary Pulliam, The Aerospace Corporation (Alternate for Dr. Alex Liang)
Livingston Holder, Holder Consulting Group

U.S. Department of Transportation

The Honorable Norman Y. Mineta, Secretary of Transportation

The Federal Aviation Administration

The Honorable Marion C. Blakey, Administrator

FAA Associate Administrator for Commercial Space Transportation

Patricia G. Smith**,** Associate Administrator for Commercial Space Transportation
George Nield, Deputy Associate Administrator for Commercial Space Transportation